4.13 Properties of Logarithms

Name _____ **Date** _____ **Period** _____

1. $\log_a 1 =$ _____

2. $\log_a a =$ _____

3. $a^{\log_a M} =$ _____

4. $\log_a a^r =$ _____

5. $\log_a (MN) =$ _____

6. $\log_a \left(\frac{M}{N}\right) =$ _____

7. $\log_a M^r =$ _____

8. If $\log_a x = \log_a 6$, then $x =$ _____.

9. If $\log_8 M = \frac{\log_5 7}{\log_5 8}$, then $M =$ _____.

10. **True or False:** $\frac{\ln 8}{\ln 2} = 2$

11. **True or False:** $\ln(x+3) - \ln(2x) = \frac{\ln(x+3)}{\ln(2x)}$

12. **True or False:** $\log_2(3x^4) = 4\log_2(3x)$

Use properties of logarithms of find the exact value of each expression. Do not use a calculator.

13. $\log_2 2^{-13}$

14. $2^{\log_2 7}$

15. $\log_8 2 - \log_8 4$

16. $\log_6 18 - \log_6 3$

17. $\log_3 8 \cdot \log_8 9$

18. $3^{\log_3 5 - \log_3 4}$

Suppose that $\ln 2 = a$ *and* $\ln 3 = b$, **use the properties of logarithms to write each logarithm in terms of *a* and *b*.**

19. $\ln \frac{2}{3}$

20. $\ln 0.5$

21. $\ln 8$

Write each expression as a sum and/or difference of logarithms. Express exponents as factors using the power property.

22. $\ln(ex)$

23. $\ln\left(\frac{e}{x}\right)$

24. $\ln\left(\frac{x}{e^x}\right)$

25. $\log_a\left(u^2v^3\right) \quad u>0, v>0$

26. $\ln\left(x^2\sqrt{1-x}\right) \quad 0<x<1$

27. $\log\left[\dfrac{x^3\sqrt{x+1}}{(x-2)^2}\right] \quad x>2$

28. $\ln\left[\dfrac{x^2-x-2}{(x+4)^2}\right]^{1/3} \quad x>2$

Write each expression as a single logarithm.

29. $3\log_5 u+4\log_5 v$

30. $2\log_3 u-\log_3 v$

31. $\log\left(\dfrac{x^2+2x-3}{x^2-4}\right)-\log\left(\dfrac{x^2+7x+6}{x+2}\right)$

32. $8\log_2\sqrt{3x-2}-\log_2\left(\dfrac{4}{x}\right)+\log_2 4$

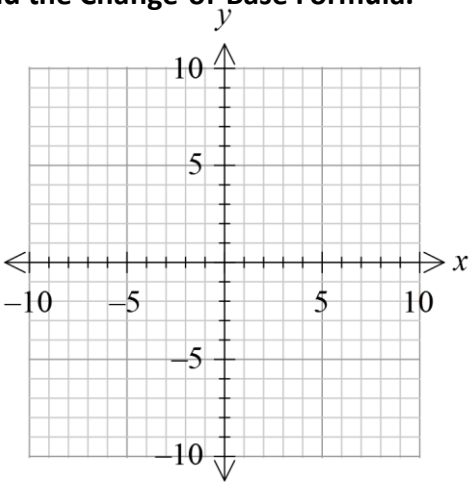
Use the Change-of-Base Formula and a calculator to evaluate each logarithm. Round your answer to three decimal places.

33. $\log_3 21$

34. $\log_5 18$

Graph the function using a graphing calculator and the Change-of-Base Formula.

35. $f(x)=\log_5 x$



Use the properties of logarithms to express y as a function of x. The constant C is a positive number.

36. $\ln y=\ln x+C$

37. $\ln y=\ln x+\ln(x+1)+\ln C$